

What is claimed is:

- 1 1. A method of parallel data communication arrangement that is susceptible to skewing
2 data which is concurrently transmitted in a plurality of multiple-bit groups, comprising:
3 receiving the concurrently-transmitted data in the plurality of multiple-bit groups; and
4 after receiving the concurrently-transmitted data, realigning skew-caused
5 misalignments between the groups.
- 1 2. The method of claim 1, wherein realigning skew-caused misalignments between the
2 groups occurs after validating the received data and before further interpretation of the
3 received data.
- 1 3. The method of claim 1, further including controlling the skewing of the data in each
2 group.
- 1 4. The method of claim 3, wherein controlling the skewing of the data in each group
2 occurs independent of each other group.
- 1 5. The method of claim 1, further including transmitting, for each group, a clock signal
2 used to synchronize the concurrently-transmitted data within each group.
- 1 6. The method of claim 1, further including transmitting a data-valid indicator and using
2 the data-valid indicator to control the reception of the data in each group.
- 1 7. The method of claim 6, wherein transmitting the data-valid indicator is performed for
2 each group of transmitted data.
- 1 8. The method of claim 7, further including coding the data into coded-data values before
2 the data is concurrently transmitted in the plurality of multiple-bit groups and wherein the
3 data-valid indicator is a unique coded-data value.

- 1 9. The method of claim 7, further including transmitting at least one special bit for each
2 group, and wherein the data-valid indicator is transmitted using the at least one special bit.
- 1 10. The method of claim 1, for each group further including: transmitting a
2 synchronization clock signal and a data-valid indicator, receiving the transmitted data by
3 sampling the data at the synchronization clock signal, and using the data-valid indicator to
4 control the reception of the data in the group.
- 1 11. The method of claim 10, for each group further including: determining that the data-
2 valid indicator indicates that valid data has been received and, in response, storing the
3 received data before realigning skew-caused misalignments between the groups.
- 1 12. The method of claim 10, wherein storing the received data for each group includes
2 storing the received data in a single-group FIFO buffer dedicated to the group, and wherein
3 realigning skew-caused misalignments between the groups includes providing a group-global
4 FIFO for storing data output from the respective single-group FIFOs.
- 1 13. The method of claim 1, wherein for each group, data is carried by a plurality of data-
2 carrying lines that are synchronized by a differential clock signal to tolerate any skew-caused
3 misalignments between data concurrently transferred in the group, the skew-caused
4 misalignments not exceeding one half clock period.
- 1 14. The method of claim 1, further including coding the data from an 8-bit value to a 6-bit
2 coded-data value for each group before the data is concurrently transmitted.
- 1 15. A parallel data communication arrangement that is susceptible to skewing data which
2 is concurrently transmitted in a plurality of multiple-bit groups, comprising:
3 means for receiving the concurrently-transmitted data in the plurality of multiple-bit
4 groups; and
5 means for realigning skew-caused misalignments between the groups after receiving
6 the concurrently-transmitted data.

- 1 16. A parallel data communication arrangement that is susceptible to skewing data which
2 is concurrently transmitted in a plurality of multiple-bit groups, comprising:
3 a receive circuit configured and arranged to receive the concurrently transmitted data
4 in the plurality of multiple-bit groups; and
5 a realignment circuit configured and arranged to realign skew-caused misalignments
6 between the groups after receiving the concurrently-transmitted data.
- 1 17. The parallel data communication arrangement of claim 16, further including a sending
2 module configured and arranged to concurrently transmit the data in the plurality of multiple-
3 bit groups.
- 1 18. The parallel data communication arrangement of claim 17, wherein realigning skew-
2 caused misalignments between the groups occurs after validating the received data and before
3 further interpretation of the received data.
- 1 19. The parallel data communication arrangement of claim 17, further including
2 controlling the skewing of the data in each group.
- 1 20. The parallel data communication arrangement of claim 19, wherein controlling the
2 skewing of the data in each group occurs independent of each other group.
- 1 21. The parallel data communication arrangement of claim 17, further including
2 transmitting, for each group, a clock signal used to synchronize the concurrently-transmitted
3 data within each group.
- 1 22. The parallel data communication arrangement of claim 17, further including
2 transmitting a data-valid indicator and using the data-valid indicator to control the reception
3 of the data in each group.

1 23. The parallel data communication arrangement of claim 22, wherein transmitting the
2 data-valid indicator is performed for each group of transmitted data.

1 24. The parallel data communication arrangement of claim 23, further including coding
2 the data into coded-data values before the data is concurrently transmitted in the plurality of
3 multiple-bit groups and wherein the data-valid indicator is a unique coded-data value.

1 25. The parallel data communication arrangement of claim 23, further including
2 transmitting at least one special bit for each group, and wherein the data-valid indicator is
3 transmitted using the at least one special bit.

1 26. The parallel data communication arrangement of claim 17, for each group further
2 including: transmitting a synchronization clock signal and a data-valid indicator, receiving
3 the transmitted data by sampling the data at the synchronization clock signal, and using the
4 data-valid indicator to control the reception of the data in the group.

1 27. The parallel data communication arrangement of claim 26, for each group further
2 including: determining that the data-valid indicator indicates that valid data has been received
3 and, in response, storing the received data before realigning skew-caused misalignments
4 between the groups.

1 28. The parallel data communication arrangement of claim 26, wherein storing the
2 received data for each group includes storing the received data in a single-group FIFO buffer
3 dedicated to the group, and wherein realigning skew-caused misalignments between the
4 groups includes providing a group-global FIFO for storing data output from the respective
5 single-group FIFOs.

1 29. The parallel data communication arrangement of claim 17, wherein for each group,
2 data is carried by a plurality of data-carrying lines that are synchronized by a differential
3 clock signal to tolerate any skew-caused misalignments between data concurrently transferred
4 in the group, the skew-caused misalignments not exceeding one half clock period.

1 30. The parallel data communication arrangement of claim 17, further including coding
2 the data from an 8-bit value to a 6-bit coded-data value for each group before the data is
3 concurrently transmitted.

1 31. A method of parallel data communication arrangement that is susceptible to skewing
2 data which is concurrently transmitted in a plurality of multiple-bit groups, comprising:
3 in each of the plurality of multiple-bit groups, concurrently transmitting the data along
4 with a synchronization clock signal and a data-valid indicator;
5 receiving the concurrently-transmitted data by sampling the data at the
6 synchronization clock signal;
7 using the data-valid indicator to control the reception of the data in the group; and
8 after using the data-valid indicator to control the reception of the data in the group,
9 realigning skew-caused misalignments between the groups.

1 32. A parallel data communication arrangement that is susceptible to skewing data which
2 is concurrently transmitted in a plurality of multiple-bit groups, comprising:
3 means for each of the plurality of multiple-bit groups, for concurrently transmitting the
4 data along with a synchronization clock signal and a data-valid indicator;
5 means for receiving the concurrently-transmitted data by sampling the data at the
6 synchronization clock signal;
7 means for using the data-valid indicator to control the reception of the data in the
8 group; and
9 after using the data-valid indicator to control the reception of the data in the group,
10 means for realigning skew-caused misalignments between the groups means.

1 33. A parallel data communication arrangement that is susceptible to skewing data which
2 is concurrently transmitted in a plurality of multiple-bit groups, comprising:
3 a first module having a transmission circuit for each of the plurality of multiple-bit
4 groups, each transmission circuit for concurrently transmitting the data along with a
5 synchronization clock signal and a data-valid indicator;

6 a second module for, each group, receiving the concurrently-transmitted data by
7 sampling the data at the synchronization clock signal, for using the data-valid indicator to
8 control the reception of the data in the group, and after using the data-valid indicator to
9 control the reception of the data in the group, for realigning skew-caused misalignments
10 between the groups.

1 34. A method of parallel data communication arrangement that is susceptible to skewing
2 data which is concurrently transmitted in a plurality of multiple-bit groups, comprising:
3 in each of the plurality of multiple-bit groups, concurrently transmitting the data along
4 with a synchronization clock signal and a data-valid indicator;
5 in each of the plurality of multiple-bit groups,
6 receiving the concurrently-transmitted data by sampling the data at the
7 synchronization clock signal,
8 using the data-valid indicator to control the reception of the data in the group,
9 and
10 after using the data-valid indicator to control the reception of the data in the
11 group, storing the received data in a single-group FIFO buffer; and
12 realigning skew-caused misalignments between the groups including using a group-
13 global FIFO buffer for storing data output from the respective single-group buffers and then
14 interpreting the data in the group-global FIFO buffer.

1 35. A parallel data communication arrangement that is susceptible to skewing data which
2 is concurrently transmitted in a plurality of multiple-bit groups, comprising:
3 means, in each of the plurality of multiple-bit groups, for concurrently transmitting the
4 data along with a synchronization clock signal and a data-valid indicator;
5 means, in each of the plurality of multiple-bit groups, for
6 receiving the concurrently-transmitted data by sampling the data at the
7 synchronization clock signal,
8 using the data-valid indicator to control the reception of the data in the group,
9 and

- 10 after using the data-valid indicator to control the reception of the data in the
- 11 group, storing the received data in a single-group FIFO buffer; and
- 12 means for realigning skew-caused misalignments between the groups including using
- 13 a group-global FIFO buffer for storing data output from the respective single-group buffers
- 14 and then interpreting the data in the group-global FIFO buffer.

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